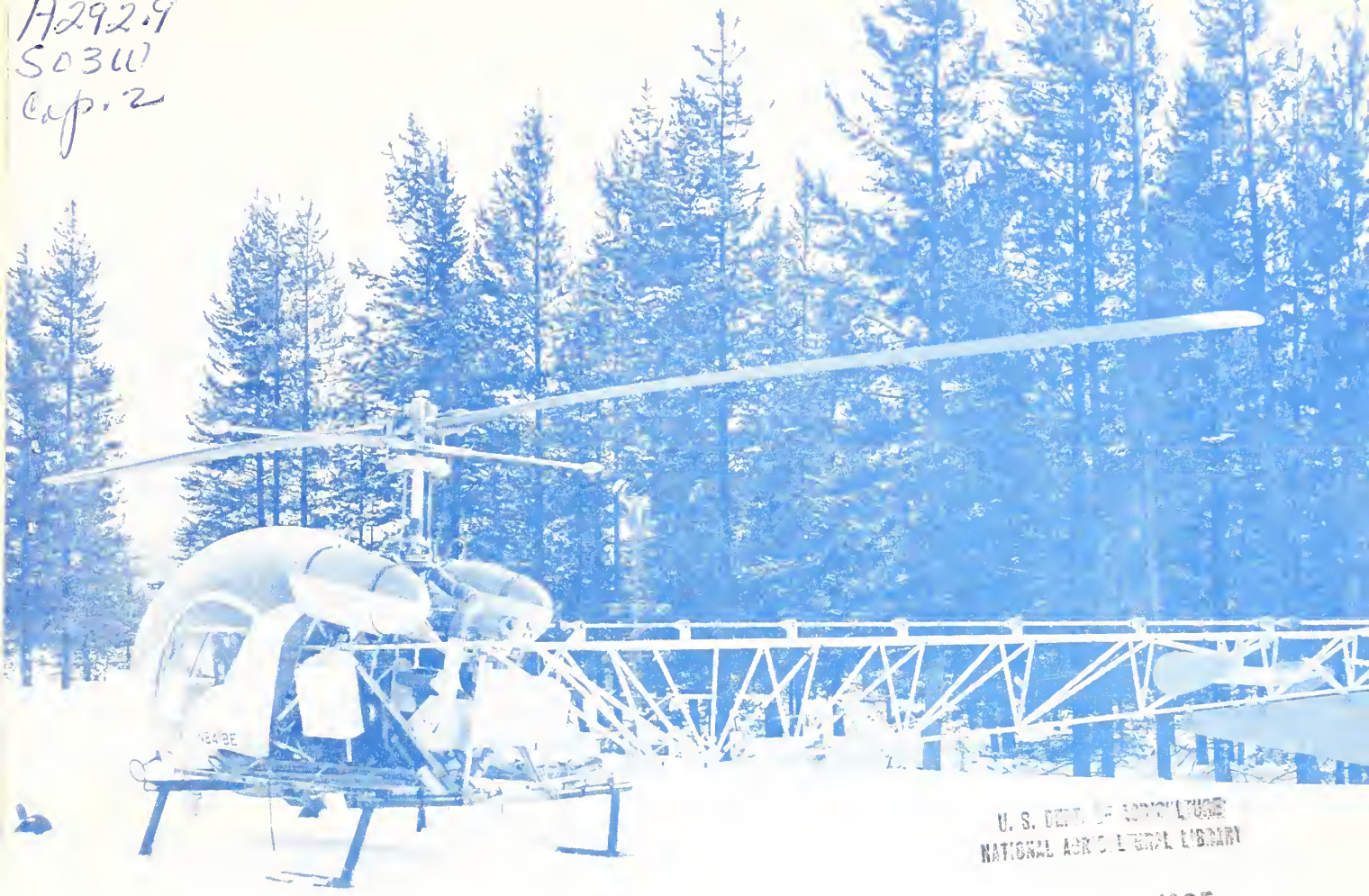


WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
MAY 1, 1965

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Soil Conservation Service, 511 N.W. Broadway - Room 507, Portland, Oregon 97209.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
BASIC DATA SUMMARY	OCTOBER 1	PORTLAND, OREGON	ALL COOPERATORS
STATES			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES - DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RESOURCES SERVICE, DEPT. OF LANDS, FOREST AND WATER RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

ISSUED

MAY 1, 1965

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

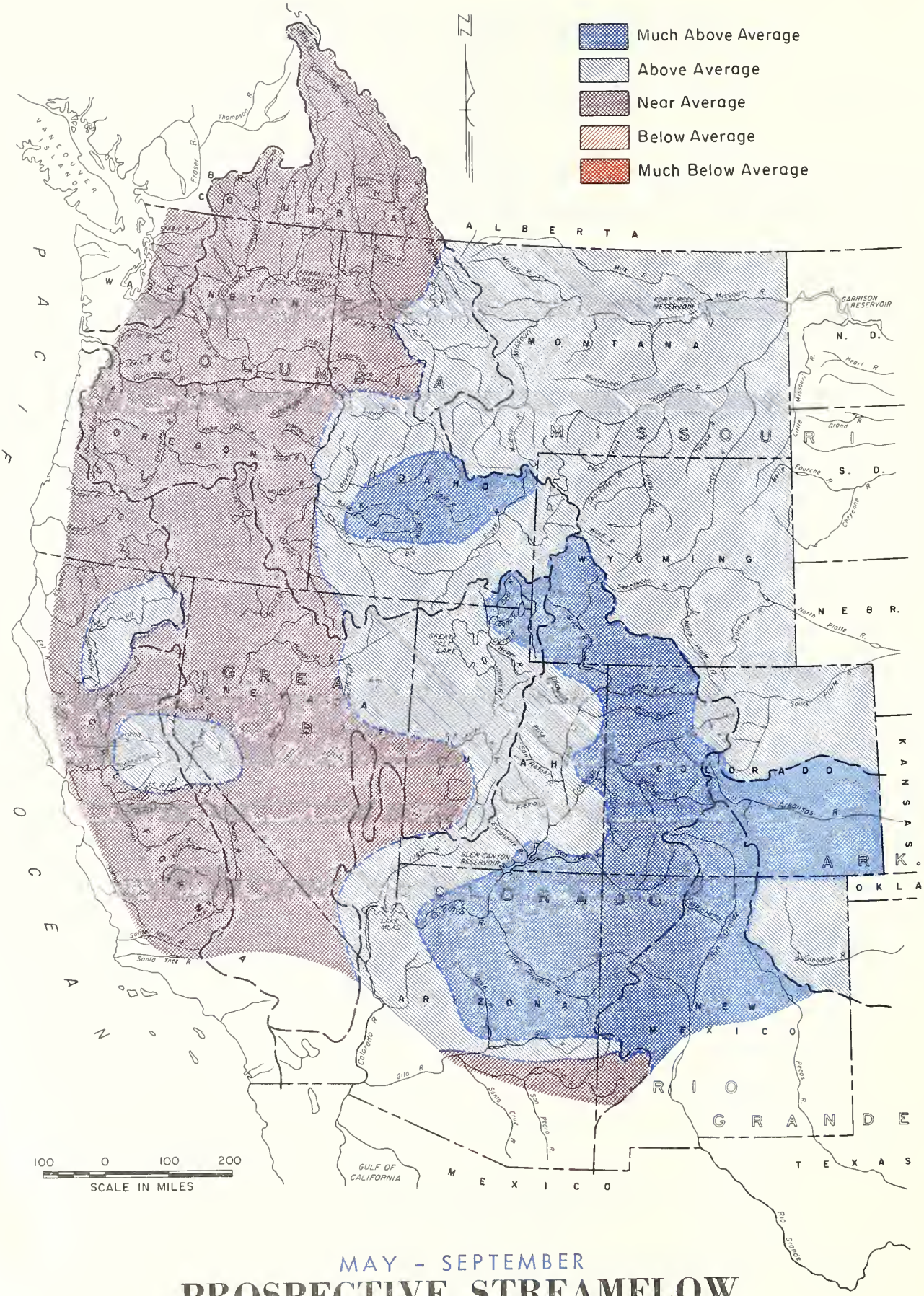
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Surveys Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D. A. WILLIAMS, ADMINISTRATOR



MAY - SEPTEMBER

PROSPECTIVE STREAMFLOW

AS OF MAY 1, 1965

USDA-SCS-PORTLAND, OREG. 1965

WATER SUPPLY OUTLOOK

As of May 1, 1965

FOLLOWING A PATTERN ESTABLISHED IN MID-WINTER SNOWMELT RUNOFF WILL BE AVERAGE OR HIGHER IN MOUNTAIN STATES IN 1965. ADEQUATE WATER SUPPLY IS ASSURED. EXTREMELY HEAVY SNOWPACK REMAINS IN CENTRAL IDAHO.

With a general improvement in water supply outlook during April, adequate water supplies are assured for 1965 in western states. The only areas where water supplies will be short are those where water demands always exceed the surface water supply, or on small streams where reservoirs are not available to store water from the peak of snowmelt to the heavy demand period of July and August. Even for these areas, outlook is better than usual.

The snow accumulation pattern in the winter of 1964-65 has been one of extremes. Record or near record precipitation fell during December and January in west coast states causing damaging floods in Oregon and California. On the other hand, February and March have been extremely dry months in the same area. Near the Continental Divide the snow accumulation rate has been more regular but seasonal totals equal or exceed the average by a substantial amount.

April and early May snowfall has tended to be above average, especially in the Colorado River Basin and adjacent areas. Excessively heavy snowpack remains in central Idaho, the headwaters of the Green and Bear rivers in Utah and Wyoming and the San Juan and Rio Grande in Colorado.

Storage in conservation reservoirs tends to be above average in Montana, Idaho, Nevada, Oregon, Washington and California even with relatively high winter releases. These releases were needed because of above average winter streamflow and to help control the anticipated heavy runoff during the spring and early summer. With a series of relatively dry years and heavy demands for water, storage is below average in southern Wyoming,and Colorado, Utah and New Mexico.

In the major river basins, the flow of the Missouri River tributaries is expected to range from about 125 to 150 percent of average during the snowmelt season, comparable to that for 1964. With April storms, the streamflow prospects for the Colorado, Rio Grande and Arkansas rivers improved oyer that of a month ago with flow expected to exceed any year since 1957 and possibly since 1952. Flow forecasts of 130 to 160 percent of average are typical for the tributaries of these southern Rocky Mountain streams. With storage depleted, heavy runoff is a welcome change in the sequence of events. More streamflow would be desirable.

The flow of the Columbia at The Dalles is expected to exceed average and that for 1964 by about ten percent. Highest flows are expected from the Snake River and its tributaries and from streams originating in western Montana. Summer flow of the Columbia in Canada and tributaries in the Washington and Oregon Cascades is expected to be near average. Flow this year will be the highest since 1956.

The California Department of Water Resources reports that water supply outlook is good for 1965. April storms improved the outlook substantially over a month ago. Streamflow forecasts for the Central Valley are for above average flows during the snowmelt season except for Kern and Tule rivers in the southern San Joaquin Valley. Reservoir storage is near capacity on the Sacramento River tributaries and in the North Coastal streams and above average on San Joaquin River tributaries. The excessive April precipitation extended to the southern California area.

For the first time in several years surface flow and storage could meet total demands along the Salt and Verde in Arizona. April streamflow and precipitation was excessive on these watersheds. Shortage continues in prospect for the Gila watershed.

MISSOURI BASIN

Above average streamflow from snowmelt is expected for all Missouri River tributaries. The seasonal flow of the Missouri and Yellowstone rivers will be among the highest years of record and comparable to those for 1964. Because much of the high flow of 1964 was generated by heavy June rains, peak flows are expected to be less than those of last year. Slightly less, but well above average streamflow is anticipated for the Platte and its tributaries in southern Wyoming, northeastern Colorado, and western Nebraska.

MONTANA

The outlook for irrigation water supply is good to excellent. High elevation snow contains near record amounts of water for this date. Some melt has occurred at low and medium mountain elevations. Snowpack ranges from 110 to 140 percent of that for this date in 1964 in the headwaters of the Missouri and Yellowstone and some 110 percent of last year on the Marias and Sun river watershed. April runoff has been relatively high.

The heavy high elevation snowpack is not expected to be a major flood threat in itself. Snowmelt can add to peak flows if there are heavy rains on a low and medium elevation snowpack such as occurred a year ago.

Mountain soils are wet except at the highest elevations where snowmelt has not started. Reservoirs are being regulated to assist in controlling snowmelt runoff.

WYOMING

With a general increase in mountain snow water content in respect to average during April, streamflow forecasts have been further increased. The flow of the Shoshone and Wind river tributaries to the Yellowstone are expected to be well in excess of average and among the higher years of record for runoff. The flow of the North Platte will be comparable to other heavy runoff years of 1952 and 1957. Carryover for 1965 will exceed that now in storage in the major reservoirs, but will probably remain less than average unless summer demands are light.

COLORADO

Water supply will be adequate in the South Platte irrigated area this year. Storage is less than average and a year ago, but prospective streamflow and transmountain diversions will be adequate to meet needs. Outside of the irrigated areas, soil moisture conditions are poor. Unless precipitation is received in the plains area soon, a substantial amount of water will be required for early irrigation demands.

ARKANSAS BASIN

In contrast to recent years, the prospects for irrigation water in the Arkansas Valley are excellent for 1965. Improvement in outlook continued through April from the midwinter months. Storage in the basin is practically non-existent and valley soils are dry as of May 1. However, the amount of streamflow anticipated should over-ride the unfavorable factors as snowmelt begins.

RIO GRANDE BASIN

The water supply prospects for 1965 on the Rio Grande are the best since 1952 and may be comparable to that year both in Colorado and New Mexico. The good prospects are considered as relative since the past fifteen years have been dry as compared to the total years of record. Storage continues to be limited on the Rio Grande and its tributaries and no substantial improvement in the storage situation from one good flow year is anticipated.

A similar outlook of above average streamflow and little storage exists for the Pecos and Canadian rivers. The water situation on these streams can be affected substantially by summer rainfall, especially at some distance from mountain areas.

COLORADO BASIN

Seasonal snowfall has been well above average throughout the winter season. A material increase in high elevation snowpack occurred in April, both on headwater streams in Colorado, Wyoming and New Mexico as well as in Arizona and Utah. The April-July 1965 forecast of inflow to Lake Powell has been increased from 10,700,000 acre feet on April 1 to 11,800,000 on May 1. This amount exceeds the total for the snowmelt period of 1963 and 1964, slightly more than for 1962 and almost equal to that of 1957.

Overall storage for the large reservoirs in the basin is slightly below average and less than half of total capacity, but a little more than for a year ago on this date.

COLORADO

Streamflow for all Colorado River tributary streams in western Colorado is expected to range near 140 to 150 percent of average and hold up well into late season. Since water supplies are generally adequate in this area, except for minimum runoff years, no water shortages are anticipated. Local flooding may be expected if snowmelt is further delayed at medium mountain elevations.

UTAH

Water supply outlook is good to excellent for Colorado River tributaries in Utah. Forecasts range from 130 to 150 percent of average except for a few small streams near the Green River in northeastern Utah where near average flows are anticipated. A local area of near average snowpack also exists in the LaSal Mountains of southeastern Utah.

ARIZONA

Except for areas served by the Gila River, water supply outlook in Arizona is good. Snowmelt runoff peaks along with runoff from record or near record precipitation during April filled reservoirs on the Verde River. Storage in Salt River Project reservoirs increased 335,000 acre feet during the month. Water storage as of May 1 is 153 percent of average

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS MAY 1, 1965

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	114	150
Madison	123	185
Gallatin	112	147
Missouri Main Stem	93	142
Yellowstone	117	145
Shoshone	113	124
Wind	117	133
North Platte	128	150
South Platte	165	137
ARKANSAS BASIN		
Arkansas	139	143
Canadian	--	--
RIO GRANDE BASIN		
Rio Grande (Colo.)	205	185
Rio Grande above Otowi Bridge	215	190
Pecos	--	--
COLORADO BASIN		
Green (Wyo.)	130	136
Yampa - White	110	130
Duchesne	151	182
Price	152	183
Upper Colorado	133	138
Gunnison	113	127
San Juan	195	175
Dolores	124	134
Virgin	183	215
Gila	--	--
Salt	--	--
GREAT BASIN		
Bear	129	162
Logan	136	150
Ogden	86	119
Weber	107	148
Provo - Utah Lake	104	142
Jordan	89	130
Sevier	264	218
Walker - Carson	320	158
Tahoe - Truckee	314	146
Humboldt	87	70
Lake Co. (Oregon)	--	--
Harney Basin (Oregon)	--	--
UPPER COLUMBIA BASIN		
Columbia (Canada)	80	90
Kootenai	92	98
Clark Fork	104	128
Bitterroot	96	124
Flathead	99	117
Spokane	85	100
Okanogan	--	95
Methow	--	85
Chelan	--	95
Wenatchee	--	70

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	135	135
Snake above Hiese, Idaho	130	150
Snake above American Falls Res	140	150
Henry's Fork	110	140
Southern Idaho Tributaries	125	120
Big and Little Wood	180	190
Boise	150	140
Owyhee	115	110
Payette	145	135
Malheur	115	110
Weiser	110	125
Burnt	100	115
Powder	100	115
Salmon	150	145
Grande Ronde	100	115
Clearwater	85	100
LOWER COLUMBIA BASIN		
Yakima	--	70
Umatilla	--	--
John Day	95	125
Deschutes - Crooked	75	80
Hood	45	60
Willamette	45	60
Lewis	--	80
Cowlitz	--	70
PACIFIC COASTAL BASIN		
Puget Sound	--	90
Olympic Peninsula	--	70
Umpqua - Rogue	80	95
Klamath	90	95
Trinity	300	60
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	190	105
Feather	275	110
Yuba	170	110
American	200	110
Mokelumne	245	110
Stanislaus	220	110
Tuolumne	260	130
Merced	260	130
San Joaquin	260	130
Kings	325	130
Kaweah	270	135
Tule	240	120
Kern	540	135

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1948-62 period.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

SELECTED STREAMFLOW FORECASTS MAY-SEPTEMBER as of MAY 1, 1965

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1964	FORECAST 1965	
UPPER MISSOURI			
Clark Fork at Chance, Montana		673	120
Gallatin near Gateway, Montana	527	536	128
Jefferson at Sappington, Montana	1187	1120	136
Madison near Grayling, Montana 1/	426	447	123
Missouri near Zortman, Montana 2/	6296	5000	129
Missouri near Williston, N. Dakota 3/	13100	12200	131
Yellowstone at Corwin Springs, Montana	2063	2180	122
Yellowstone at Miles City, Montana		7000	132
Shoshone below Buffalo Bill Res., Wyoming 4/		915	121
Wind at Dubois, Wyoming		130	138
PLATTE			
Clear at Golden, Colorado	84	181	140
North Platte at Saratoga, Wyoming		770	139
Cache LaPoudre near Ft. Collins, Colorado 6/		303	127
ARKANSAS			
Arkansas at Salida, Colorado 7/	281	490	151
RIO GRANDE			
Rio Grande near Del Norte, Colorado 8/	292	656	147
Rio Grande at Otowi Bridge, New Mexico 9/ (May-July)		910	207
Pecos at Pecos, New Mexico		73	174
UPPER COLORADO			
Animas at Durango, Colorado		574	126
Colorado at Glenwood Springs, Colorado 10/		1955	138
Colorado near Cisco, Utah		5400	164
Colorado, Inflow to Lake Powell, Arizona 11/**		11800	153
Duchesne near Tabiona, Utah 12/		141	136
Green, Inflow to Flaming Gorge Res., Utah **		1660	147
Green near Green River, Utah 13/		4370	151
Gunnison near Grand Junction, Colorado		1650	147
Price near Scofield, Utah 14/		45	155
San Juan near Bluff, Utah 15/		1600	166
White at Meeker, Colorado		417	139
Yampa at Steamboat Springs, Colorado		344	139
LOWER COLORADO			
Gila at Virden, Arizona			
Salt at Intake, Arizona			
Verde above Horseshoe Dam, Arizona			
GREAT BASIN			
Bear at Harer, Idaho 16/	252	380	188
Logan near Logan, Utah 17/		170	145
Ogden, Inflow to Pine View Res., Utah 18/ (May-July)		86	119
Provo at Vivian Park, Utah 19/		155	132
Sevier at Hatch, Utah 20/		47	120
Sevier near Kingston, Utah		24	121
Humboldt at Palisades, Nevada **	200	150	119
Truckee at Farad, California ** 21/	126	220	116
West Walker near Coleville, California **	76	180	146

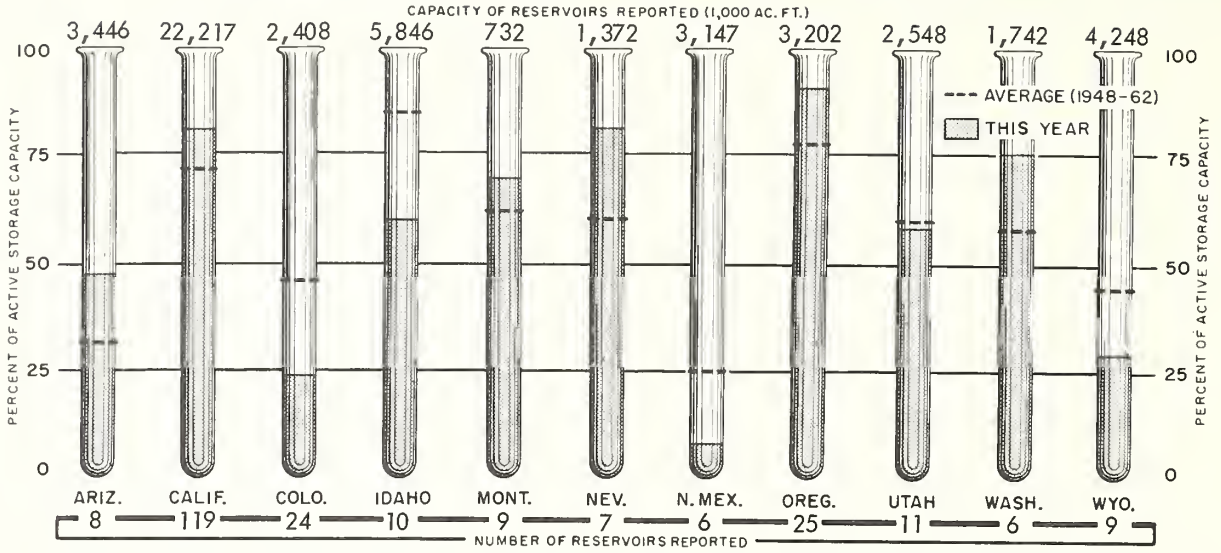
Forecasts in California provided by Department of Water Resources.
Average is for 1948-62 period except California. California is computed for 1908-57 period.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

SELECTED STREAMFLOW FORECASTS MAY-SEPTEMBER as of MAY 1, 1965

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1964	FORECAST 1965	
UPPER COLUMBIA			
Bitterroot near Darby, Montana	695	656	127
Chelan at Chelan, Washington 22/		1200	98
Clark Fork above Missoula, Montana	1960	2090	131
Clark Fork at Whitehorse Rapids, Montana 23/		15100	120
Columbia at Revelstoke, British Columbia	20345	19500	104
Columbia at Birchbank, British Columbia 24/	43671	41500	98
Columbia at Grand Coulee, Washington 24/	66200	65450	103
Columbia at The Dalles, Oregon 24/	100900	104160	110
Flathead near Polson, Montana 23/	8153	8150	118
Kootenai at Wardner, British Columbia	4728	4900	106
Kootenai at Leonia, Idaho	8516	8600	102
Okanogan near Tonasket, Washington	1928	1710	95
Spokane at Post Falls, Idaho 25/	2987	2470	109
SNAKE			
Big Lost, Inflow to Mackay Res., Idaho 26/	158	255	185
Big Wood, Inflow to Magic Res., Idaho 27/	220	320	198
Boise above Diversion Dam, Idaho 28/	1300	1900	152
Clearwater at Spalding, Idaho	9424	8300	115
Malheur near Drewsey, Oregon		40	114
Owyhee Res. Net Inflow, Oregon 18/		205	111
Payette near Horseshoe Bend, Idaho 29/	1522	2100	133
Salmon at Whitebird, Idaho	6957	8700	140
Snake near Heise, Idaho 30/	3976	4500	129
Snake at Weiser, Idaho		--	--
LOWER COLUMBIA			
Cowlitz at Castle Rock, Washington		2050	92
Deschutes at Benham Falls, Oregon 31/ (April-Sept.)		662	105
Grande Ronde near LaGrande, Oregon		133	110
Hood near Hood River, Oregon 32/		240	86
Willamette at Salem, Oregon 33/ (April-Sept.)		5010	90
Yakima near Parker, Washington 34/		1480	97
NORTH PACIFIC COASTAL			
Dungeness near Sequin, Washington		141	98
Rogue at Raygold near Central Point, Oregon		700	96
Klamath Lake, Net Inflow, Oregon 35/		500	114
CALIFORNIA CENTRAL VALLEY 36/**			
American, Inflow to Folsom Res., Calif.	912	1740	125
Feather near Oroville, Calif.	1165	2060	106
Kaweah near Three Rivers, Calif. 37/	163	300	114
Kern near Bakersfield, Calif.	183	410	95
Kings, Inflow to Pine Flat Res., Calif.	615	1290	110
Merced, Inflow to Exchequer Res., Calif.	310	680	109
Mokelumne, Inflow to Pardee Res., Calif.	309	630	131
Sacramento, Inflow to Shasta Res., Calif.	1183	2200	123
San Joaquin, Inflow to Friant Res., Calif.	643	1340	110
Stanislaus, Inflow to Melones Res., Calif.	432	910	123
Tule, Inflow to Success Res., Calif.	33	55	98
Tuolumne, Inflow to Don Pedro Res., Calif.	743	1440	119
Yuba at Smartville, Calif.	767	1200	107

Explanatory Notes on Forecasts Listed on Inside Back Cover.
*** April - July Period*

RESERVOIR STORAGE as of MAY 1, 1965



and 71 percent of capacity. There is a substantial amount of snow remaining at the highest elevations. Demands have exceeded inflow to San Carlos on the Gila and pumping will be required.

GREAT BASIN

UTAH

With precipitation for April equal to that for six months winter period in southwestern Utah there has been a sugstantial improvement in water supply prospects in this area since April 1. Water supply outlook from the Sevier River in southern Utah to the Bear River in northern Utah is excellent for 1965. As has been the situation since mid-winter, streamflow will be relatively higher on watersheds in the Salt Lake City area and north to the Idaho border. However flows will be substantially less than for the high runoff year of 1952.

NEVADA

Water supply outlook for 1965 remains excellent with little change from a month ago. The portion of the state south of Tonapah had heavy precipitation during the first two weeks of April, making the outlook for southern Nevada fair to good.

Streamflow forecasts for the next three months range from 100 to 150 percent of average with the highest streamflow expected on east slope Sierra streams.

Irrigation reservoirs are 80 percent of capacity and 132 percent of the May 1 average. A substantial carryover for the 1966 season is assured. High elevation snowpack is well above average and soils are wet.

COLUMBIA BASIN

The forecast for the Columbia at The Dalles for the May-September 1965 period is 104,000,000 acre feet or 110 percent of average as compared to a flow of about 100,000,000 acre feet in 1964. The flow in 1965 will exceed that for any year since 1956.

Seasonal totals of snowfall will produce near average flows from the British Columbia section of the basin along with streams originating in the Cascade Range in Oregon and Washington. Near record flows are expected from the Clark Fork in western Montana and on Snake River tributaries in central Idaho.

Much of the existing snowpack was accumulated during heavy precipitation periods of December and January. February and March precipitation tended to be deficient, while April precipitation was generally a little above average.

The relatively high streamflow forecasts will produce some degree of high water damage in central and southwestern Idaho and to a lesser degree along the lower Columbia. The river stages are dependent to some extent on precipitation and temperature sequences in May and early June. The controlled peak flow forecast for the Columbia at The Dalles is in the 50 percent probability range of 600,000 to 700,000 cubic feet per second as compared to about 670,000 cubic feet per second in 1964. Peak flow forecasts are prepared by the Columbia Basin Cooperative Forecasting Unit of the U. S. Army Corps of Engineers and the U. S. Weather Bureau.

BRITISH COLUMBIA

Snow survey measurements made near May 1 indicate that British Columbia mountain snow-

STORAGE IN LARGE RESERVOIRS — MAY 1, 1965

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Boysen	560	224
Buffalo Bill	380	117
Canyon Ferry	2043	1589
Hebgen	385	199
Tiber	1316	816
Belle Fourche	185	183
Keyhole	190	129
Fort Peck	19105	15950
Fort Randall	6100	3945
Garrison	24500	13909
Oahe	23600	12032
Big Bend		1581
PLATTE		
Glendo	786	427
Pathfinder	1011	143
Seminoe	982	90
Colo-Big Thompson (4)	865	288
ARKANSAS		
Conchas	280	7
John Martin	367	0
RIO GRANDE		
Elephant Butte	2207	147
El Vado	194	29
UPPER COLORADO		
Flaming Gorge	3789	585
Navajo	1709	388
Powell	28040	6171
LOWER COLORADO		
Havusu	619	541
Mead	27209	11677
Mohave	1810	1710
San Carlos	1206	75
Salt River Res. (4)	1755	1248
Verde River Res. (2)	322	307
GREAT BASIN		
Bear	1421	1017
Lahontan	286	258
Rye Patch	179	160
Sevier Bridge	236	57
Strawberry	270	77
Tahoe	732	546
Utah	1149	542

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	369
Coeur d'Alene	238	524
Flathead	1791	1132
Hungry Horse	2982	1564
Kootenay	673	776
Pend Oreille	1155	1154
Roosevelt	5232	3252
LOWER COLUMBIA		
Detroit	300	272
Hills Creek	249	166
Lookout Point	337	208
Yakima Res. (5)	1066	925
SNAKE		
American Falls	1700	1702
Arrowrock	287	235
Anderson Ranch	423	261
Brownlee	1427	558
Cascade	653	315
Jackson	847	401
Lucky Peak	278	20
Palisades	1202	315
Owyhee	715	715
PACIFIC COASTAL		
Clear Lake	440	303
Upper Klamath	584	491
Ross	1203	839
Trinity	2500	2379
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	918
Berryessa	1602	1617
Cachuma	205	140
Casitas	254	48
Cherry Valley	268	119
Don Pedro	290	220
Folsom	1010	840
Hetch-Hetchy	360	133
Isabella	570	157
McClure	281	201
Millerton	521	389
Nacimiento	350	213
Pardee	210	182
Pine Flat	1013	624
Shasta	4500	4423

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

pack is below average on Vancouver Island with close to average snowpack on Columbia River watersheds. Snowmelt flows are expected to follow this snowpack pattern by providing close to average runoff volumes on most basin.

As is usually the case, low and middle elevation snow courses have reported snowpack decreases from those of a month ago, indicating a normal melt rate during April. Continuation of this normal temperature pattern during May and early June should produce close to average maximum stages on major rivers in the Province.

IDAHO

The water supply outlook is excellent with excessive water supplies on many rivers throughout the state. Watersheds with especially high snow cover include the upper Salmon, Boise, Payette, Big and Little Wood and Big and Little Lost rivers. Snowfall and precipitation during April was significantly above normal. High elevation snow courses increased in water content during April when they would ordinarily lose water. Snowmelt did occur at intermediate elevations and streamflow was well above normal on all rivers during the month.

The problems of heavy streamflow from the large snowmelt yet to come have increased because more water must come down in less time.

Reservoir stored water is relatively high, even with reservoirs being lowered over the past three months to assist in controlling peak flows from snowmelt.

MONTANA

Snowmelt season streamflow will be in the range of 130 percent of average for the Clark Fork and Flathead rivers and their tributaries. Near average flow is anticipated for the Kootenai through the state. High elevation snowpack has near record snow water equivalents but much of the low and medium elevation snow has melted. Streamflow will be in excess of all requirements.

OREGON

Water users in Oregon can expect average to excellent water supplies. Mountain snowpacks are unusually heavy at very high elevations, but at low and medium elevations most of the snow has melted. Stored water for irrigation purposes is at a record high, state-wide. Soils in mountain watersheds are extremely wet. Forecasts of seasonal streamflow are generally near average with the highest forecasts of 125 percent of average expected for the John Day and Wallowa River Basins.

WASHINGTON

The water supply for irrigation and power will be adequate for the 1965 season. There was considerable melting of low and intermediate elevation snowpack during April. Increases in high elevation snowpack was less than average for April. Reservoirs for all irrigated areas will fill during the snowmelt runoff period.

In general streamflow from the Cascades Range will be slightly less than average, near average for the Columbia main stem through the state, and well above average for the Snake River from Idaho.

WYOMING

The flow of the Snake River and tributaries in Wyoming will be about 125 percent of average during the snowmelt season. Reservoirs in the upper basin have been lowered to help control peak runoff through downstream areas in Idaho.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that water supply will be above normal in almost all areas in the state during the current season of major use--which has now started. Unusually heavy precipitation during the first half of April materially contributed to California's existing favorable water supplies north of the Tehachapi Mountains. Southern California also benefited from heavy April precipitation which brought about significant improvements in the water supplies for this area.

With only negligible precipitation in the State since the first part of January, the rains finally returned to California during April. Beginning April 1, California experienced precipitation statewide that continued intermittently with moderate to heavy amounts through the 22nd of the month. Stations in most of northern and central California reported precipitation twice that normally expected during the month. During the second week, the Sierra was blanketed with over two feet of new snow. In southern California, precipitation was in abundance, with April normals exceeded as early as the 2nd of the month. The total precipitation in this area during April alone was greater than the combined totals of the previous six months. Statewide, the precipitation during April was 230 percent of the normal expected for April, with the Lahontan area being the lowest in the state, receiving only 130 percent of its normal expectancy for April. In the Central Valley area of California, precipitation during April was almost 200 percent of normal, 195 for the San Joaquin Valley, and 200 for the Sacramento Valley. In the San Joaquin Valley,

precipitation values were 300 percent of normal on the Kern River and 160 percent of normal in the Tuolumne River Basin. In the Sacramento Valley, precipitation during April ranged from 220 percent of normal for the Mokelumne River Basin to 170 percent of normal for the Feather River Basin. The statewide average of precipitation to date in California is now 115 percent of normal, mainly reflecting the flood-producing storms of December and January, plus the heavy precipitation during April.

Runoff of California streams during April was generally above normal, averaging 130 percent for the state. Runoff for Central Valley streams averaged 140 percent of normal for the month, decreasing generally from north to south, with runoff for the Upper Sacramento Valley at 186 percent of normal and the Kern River near Bakersfield at 83 percent of normal.

May 1 forecasts of runoff in the Sacramento River for the April-July period have been revised upward approximately 20 percent above those reported on April 1. This upgrading reflects the near double amount of normal precipitation received during the month of April. Individual stream forecasts ranged from a high of 131 percent of normal for the Mokelumne River, inflow to Pardee (reported as the high for the Sacramento Valley last month), to 106 percent of normal for the Feather River at Oroville. In the San Joaquin Valley, forecasts were increased about 15 percent from those reported one month ago. Here the range in forecasts for individual streams vary from 123 percent of normal for the Stanislaus River inflow to Melones Reservoir, to 95 percent of normal for the Kern River at Bakersfield.

Measurements of snowpack were obtained at 120 snow courses throughout California on or about May 1. Key courses indicate that the state's snowpack water content was 115 percent of average for May 1. The water content of the snowpack in almost all Sierra drainages of the Sacramento Valley was at 110 percent of average for May 1. In the San Joaquin Valley, most major drainages were 130 percent of average for May 1, except for the two southernmost, the Kaweah and Kern, which were 135 percent of average for May 1. The elevation of the effective snowline for Sierra watersheds ranged from about 5,500 feet in the north to 7,500 feet in the south.

In the Sacramento Valley during April, reservoirs filled to 93 percent of their aggregate capacity and the major reservoirs in the North Coastal area were 95 percent of their capacity. San Joaquin Valley reservoirs, which normally fill more slowly during April, are now storing 54 percent of their combined capacity, which amounts to 103 percent of the 10-year May 1 average. In general, it can be concluded that California has an abundance of water in storage to meet the demands of the 1965 irrigation season.

EXPLANATION of STREAMFLOW FORECASTS

1/ Observed flow adjusted for change in storage in Hebgen Lake. 2/ Observed flow adjusted for change in storage in Canyon Ferry and Tiber reservoirs. 3/ Observed flow adjusted for change in storage in Canyon Ferry, Tiber, Fort Peck, Buffalo Bill, and Boysen reservoirs. 4/ Observed flow adjusted for change in storage in Buffalo Bill Reservoir plus Heart Mt. Diversion. 5/ Observed flow minus diversion through Jones Pass Tunnel.

6/ Observed flow minus diversions from North Platte, Colorado, and Laramie rivers plus measured diversions for irrigation and municipal use above station. 7/ Observed flow adjusted for change in storage in Clear Creek, Twin Lakes, and Sugar Loaf reservoirs minus trans-mountain diversions through Busk-Ivanhoe and Twin Lakes tunnels and Ewing, Fremont, Wurtz, and Columbine ditches. 8/ Observed flow adjusted for change in storage in Santa Maria, Rio Grande, and Continental reservoirs. 9/ Observed flow adjusted for changes in storage in reservoirs listed in (8) plus Terrace, Sanchez, Platoro, and El Vado reservoirs. 10/ Observed flow adjusted for changes in storage in Granby Reservoir plus diversions through Adams Tunnel and Grand River Ditch.

11/ Observed flow adjusted for changes in storage in Flaming Gorge, Navajo, and Lake Powell. 12/ Observed flow plus diversion through Duchesne Tunnel. 13/ Observed flow adjusted for changes in storage in Flaming Gorge and Big Sandy reservoirs. 14/ Observed flow adjusted for change in storage in Scofield Reservoir. 15/ Observed flow adjusted for change in storage in Navajo Reservoir.

16/ Observed flow. 17/ Observed flow plus Utah Power and Light Tailrace and Logan, Hyde Park, and Smithfield canals. 18/ Record computed by Bureau of Reclamation. 19/ Observed flow adjusted for change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake Aqueduct. 20/ Observed flow.

21/ Observed flow exclusive of Lake Tahoe and adjusted for change in storage in Boca Reservoir. Forecast by Truckee Basin Water Committee. 22/ Observed flow adjusted for change in storage in Lake Chelan. 23/ Observed flow adjusted for change in storage in Flathead and Hungry Horse reservoirs. 24/ Observed flow adjusted for change in storage in any or all of the following reservoirs above the station: Kootenay, Hungry Horse, Flathead, Pend Oreille, Coeur d'Alene, F. D. Roosevelt, Lake Chelan, Noxon, and Brownlee; and pumping from F.D.R. Lake. 25/ Observed flow adjusted for change in storage in Coeur d'Alene Lake plus diversions to Spokane Valley Farms and Rathdrum Prairie canals.

26/ Observed flow adjusted for change in storage in Mackay Reservoir plus diversion in Sharp Ditch. 27/ Combined flow of Big Wood near Belleview and Camas Creek near Blaine. 28/ Observed flow adjusted for changes in storage in Lucky Peak, Anderson Ranch, and Arrowrock reservoirs. 29/ Observed flow adjusted for changes in storage in Cascade and Deadwood reservoirs. 30/ Observed flow adjusted for changes in storage in Palisades and Jackson reservoirs.

31/ Observed flow adjusted for changes in storage in Crane Prairie, Wickiup, and Crescent Lake reservoirs. 32/ Adjusted to natural flow. 33/ Observed flow adjusted for changes in storage in Lookout Point, Detroit, Cottage Grove, Dorena, and Hills Creek reservoirs. 34/ Observed flow adjusted for changes in storage in Keechelus, Kachess, Cle Elum, Bumping, and Tieton reservoirs, plus diversions by Kosa, New Reservation, Old Reservation, and Sunnyside canals. 35/ Flow records provided by PP&L and USBR.

36/ All forecasts are for unimpaired streamflow except Kaweah River. 37/ Not corrected for upstream impairments. All other forecasts are for observed flow.

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